401 PLANT MIX PAVEMENTS - GENERAL

401.01 DESCRIPTION

These specifications include general requirements that are applicable to all types of bituminous pavements of the plant mix type irrespective of gradation of aggregate, kind and amount of bituminous material, or pavement use. Deviations from these general requirements will be indicated in the specific requirements for each type.

This work shall consist of furnishing, mixing, and placing materials for bituminous concrete pavements. Construction with bituminous mixtures shall meet these specification requirements and shall meet the requirements for the type of bituminous mixture as designated on the plans or in the special provisions. Materials shall be placed to the depth, grade, and cross section shown in the contract documents and/or as directed by the Engineer.

401.02 COMPOSITION OF MIXTURES

The bituminous plant mix shall be composed of a mixture of fine and coarse aggregate, mineral filler, bituminous material, and strip additive or hydrated lime and other additives when required.

TABLE 401.02

JOB MIX TOLERANCES
FOR MIXTURE AND FINE AGGREGATES

DESCRIPTION	MAXIMUM TOLERANCE (+ or -)
SIEVE SIZE, Percent Passing by Weight (inclusive), AASHTO T 30	
No. 4 and larger	7
No. 10 to No. 50	6
No. 80 to No. 100	4
No. 200	3
BITUMEN CONTENT, Percent by Weight	
AASHTO T 164	0.50
HYDRATED LIME	0.20
SOFTENING AGENT	0.20
LIQUID ANTI STRIP ADDITIVE	0.20

A job mix formula shall be submitted and approved in conformance with 818.01 prior to use.

The job mix formula shall remain in effect until a revised formula is submitted and approved or the formula is changed by the Engineer.

Results of single tests per 500 tons or fraction thereof of bituminous mixture for gradation and bitumen content shall meet the approved job mix formula and shall not exceed the tolerances of Table

401.02 and shall be within the total job mix tolerances specified in 818.02. Tolerances for delivery temperature shall be + or - 25°F but shall not exceed the temperature limits specified in Table 818.02.

401.03 MATERIALS

Approval of the sources of supply and acceptance of the materials that are proposed for use shall be obtained prior to starting the construction, and in accordance with 106.

The materials for bituminous pavements shall be of the grade and type specified for the mixture designated and shall meet the following requirements:

Asphalt Cement - 802.02
Coarse Aggregate - 803.04
Fine Aggregate - 803.03
Mineral Filler - 803.05
Cut-back Asphalt - 802.04
Emulsified Asphalt - 802.05
Hydrated Lime - 821.03(A)
Liquid Anti Strip Additives - 802.08
Softening Agent - 802.07

401.04 WEATHER AND SEASONAL RESTRICTIONS

Bituminous concrete mixes shall not be placed at certain times of the year as indicated in Table 401.04 or when the ambient air temperature is below that in the table or when weather conditions otherwise prevent the proper handling, placing and compaction of the mixture.

401.05 EQUIPMENT

Bituminous Mixing Plants - 904.01
Distributors - 904.03
Trucks - 904.02
Laydown Equipment - 904.04
Rollers - 904.05
Hand Tools - 904.06
Planing Machine - 903.01

TABLE 401.04

RESTRICTIONS ON PLACEMENT OF BITUMINOUS MIXES

Surface Mixes	Temperature (°F)	Dates

Light Cover	60	Nov. 1 - April 15
Sheet Asphalt	60	Nov. 15 - April 15
Other Surface Mixes		
Lift Thickness		
Less Than 1-1/4"	50	Dec. 1 - April 1
Over 1-11/4"	40	Dec. 1 - April 1
Base or Binder	40	Dec. 1 - April 1

401.06 HAULING OF ASPHALTIC MIXTURES

Asphaltic paving mixtures shall be transported from the mixing plant to the project site in trucks conforming to the requirements of 904.02.

Shipments found to contain an excess amount of liquid asphalt, moisture, or lubricant, or other foreign material, or if delivered outside of the approved job mix temperature of the bituminous mixture, shall be rejected. No loads shall be dispatched at such time as will prevent completion of the spreading and compaction of the mixture during daylight, unless artificial light satisfactory to the Engineer is provided.

401.07 PREPARATION OF BASE OR EXISTING SURFACE

Before spreading materials, the surface upon which the mix is to be placed shall be cleaned as indicated herein. After cleaning and while surfaces are dry and free from all objectionable matter, Tack Coat or Prime Coat, as specified, shall be applied to all areas in accordance with 406 or 407.

All cracks, joints, and areas covered with bitumen that in the opinion of the Engineer will tend to cause fat spots to come up through the surface material shall be removed to the satisfaction of the Engineer. This work must be performed so that the concrete will not crack. Particular care must be used to avoid any discoloration or damage to the curb. Any portland cement concrete pavement or curb broken through carelessness on the Contractor's part shall be replaced by the Contractor without cost to the District. After the cleaning operation, the Contractor shall completely fill and thoroughly compact asphaltic concrete in the joints, cracks, spalled areas, and scaled areas as directed by the Engineer.

For sheet asphalt patching work, all areas shall be carefully cleaned of all asphalt and unsound concrete to the satisfaction of the Engineer. Dust and dirt then shall be removed by compressed air or by careful brooming so as to leave surfaces dry and clean to sound pavement.

Loose rust shall be removed from the streetcar tracks by sanding and by use of wire brushes to the satisfaction of the Engineer. Track rail grooves shall be swept clean.

All refuse material shall be hauled away and disposed of by the Contractor at his own expense.

401.08 PREPARATION OF MATERIALS

(A) ASPHALT. Asphalt Cement as received at the mixing plant shall be such that it will remain within the specified limits throughout the entire period of its use. The asphalt cement when delivered to the

mixer shall be at the temperature specified.

(B) AGGREGATES. Aggregates shall be delivered, handled, and stored in a manner so as to prevent segregation, contamination, and mixing of material from other sources. Aggregate storage facilities and handling shall meet the requirements of 106.

Flames used for drying and heating shall be properly adjusted to avoid injury to the aggregates. Absorbed moisture in the aggregate shall be reduced to such a quantity that there is no flushing of asphalt resulting from escaping water vapor in the prepared mixture.

(C) MINERAL FILLER. Mineral Filler shall be stored in a clean, dry, dust-tight compartment equipped with a worm or other approved mechanical feeding device for accurately depositing the required amount into the weigh box.

(D) HYDRATED LIME. Hydrated lime shall be delivered, handled and stored in a manner so as to prevent contamination and kept dry until mixed into a slurry.

401.09 MIXING AND HOLDING

Mineral aggregates, prepared as prescribed in 401.08, shall be combined in the proportionate amounts required to meet the approved job mix formula. The asphalt cement shall be weighed, measured, or gauged and introduced into the mixer in the amount required by the approved job mix formula for the bituminous mixture being produced. Final acceptance of the amount and type of liquid anti strip additive or hydrated lime shall be based on a minimum of 95 percent coated particles tested in accordance with the boiling test (D.C. Test Method B 102) on a sample of plant produced material.

Hydrated lime shall be weighed, measured, or metered and combined with the aggregates prior to drying or mixing in the maximum amount of 1.5 percent hydrated lime by weight of total mixture for the bituminous mixture being produced. The hydrated lime shall be distributed on the aggregates in the form of lime-water slurry. The lime-water slurry shall have the consistency to allow uniform distribution on the aggregate. Should the Contractor elect to use an alternate method he shall submit his plan to the Engineer in writing for approval along with the job mix formula.

Liquid anti strip additive shall be metered and combined with the asphalt cement prior to discharge into the mixing chamber. When batch plants are used, prior to adding the asphalt cement, the combined mineral aggregates shall be thoroughly mixed dry for 10 seconds. Upon approval of the Engineer, dry mix times may be less than 10 seconds after it has been demonstrated to the Engineer that the requirements of 401.02 are met.

The asphalt cement shall be distributed over the mineral aggregates and the whole mass thoroughly wet mixed for a period of at least 30 seconds to produce a homogenous and uniformly coated mixture. Upon approval of the Engineer, another wet mixing time may be established based on a minimum of 95 percent coated particles as determined by AASHTO T 195. Mixtures with maximum size aggregate passing the No. 4 sieve will be visually examined by the Engineer to determine minimum wet mix times.

The dry mix time is defined as the interval of time between the opening of the weigh box gate and the application of asphalt cement. The wet mix time is the interval of time between the application of asphalt cement and the opening of the mixer gate.

The mineral filler, when used, shall be introduced in such a manner that it will be uniformly

incorporated in the mass. For the continuous mix type plants, the mixing time may be regulated by fixing a minimum gauge in the mixing unit and/or by other mixing unit adjustments that may be directed by the Engineer. All mixing plants for the preparation of bituminous mixtures shall conform to the requirements of 904.01. The mineral constituents of the asphaltic mixture shall be so combined with the asphalt cement so that the resulting composite mixture will meet the grading, bitumen content, and temperature requirements of the approved job mix formula.

Storing or holding of bituminous materials will be permitted provided the characteristics of the mixture are substantially the same as those of the mixing plant.

When allowed, the Contractor shall sample in the presence of the Engineer, hot asphaltic paving mixtures stored for more than 24 hours. Two samples shall be obtained, one from the top and one from the bottom of the storage or surge bin. Test results obtained by the District for both samples shall conform to tolerances of the approved job mix formula. In the event the bitumen content, gradation or temperature of either sample is not within job mix tolerances, the material shall be removed from the roadway at no cost to the District. The Contractor shall provide a sample of the mixture taken between the pugmill and storage or surge bin when requested.

401.10 SPREADING AND FINISHING

(A) GENERAL. Asphaltic paving mixtures shall be laid only on surfaces that are dry and when weather conditions are satisfactory. Spreading of asphaltic mixtures will not be permitted during rain, except that the Engineer may allow the placing of mixture overtaken in transit from the plant by a sudden rain, provided the mixture is within the temperature limits specified and can be satisfactorily placed and rolled. Loads mixed and dispatched to the site of work after rain has commenced shall be rejected.

All asphaltic mixtures shall be spread and finished by a bituminous paver where practicable. Permission to spread and finish by hand must be secured from the Engineer. The placing of all asphaltic mixtures shall be as continuous as practicable and in a manner to eliminate joints. Asphaltic mixtures of the same type but from different plants shall not be used alternately on the same section of a project. Contact surfaces of curbs, gutters, manholes and similar structures shall be painted with a thin uniform coating of hot asphalt cement or rapid setting emulsified asphalt, prior to placing the hot asphaltic mixture against them. Bituminous mixtures shall not be placed on a surface that is contaminated.

(B) PLACING AND FINISHING BY MACHINE. All spreading and finishing machines shall meet the requirements of 904.04. The width placed by the machine shall be as approved by the Engineer, within the capabilities of the equipment. The Contractor is advised that the echelon method of spreading asphaltic mixtures shall be employed wherever, in the opinion of the Engineer, a roadway is of sufficient width and area to permit the use of two or more pavers or the location of the project requires their use. Direction of the pavers shall not be changed by turning on newly placed bituminous pavements.

When placing asphaltic mixtures, joints shall be formed at the end of each day's work or when placing is discontinued for such period of time that the material cools below 140°F. The joints shall be formed by laying and rolling against boards of the thickness of the compacted mixture or by such methods as may be approved by the Engineer.

(C) PLACING AND FINISHING BY HAND. Tools for placing and finishing by hand shall conform to the requirements of 904.06. The Contractor shall provide means for keeping all small tools clean and free from accumulations of asphaltic materials. The mixture shall be distributed by means of hot

shovels of approved size and shape and spread with hot rakes to the thickness specified. In spreading, the loose material shall be thoroughly raked throughout its depth. Attention shall be paid to raking the loose material to its full thickness with the tines of the rake in order to eliminate voids. Boards of sufficient length and proper thickness shall be laid on the base course to check the thickness of the loose material and as a means of obtaining a uniform grade. The thickness of the boards shall be frequently checked for accuracy.

Immediately after placing and raking the mixture, and prior to initial rolling, the surface of the mixture shall be smoothed by the use of a lute which conforms to the requirements of 904.06(A).

401.11 COMPACTION OF ASPHALTIC MIXTURES

A minimum of 2 rollers meeting requirements of 904.05 will be required, a 2-axle 10 to 12 ton tandem roller and a 2-axle roller of 5 ton to 8 ton capacity. No separate or additional compensation will be allowed. At the option of the Contractor and with the approval of the Engineer, intermediate rolling of asphaltic mixtures may be accomplished by the use of self-propelled pneumatic tired rollers meeting the requirements of 904.05. Initial and finish rolling, however, shall be done by steel- wheeled rollers. Each roller shall be operated by a competent, experienced operator, and while work is underway, must be kept as nearly as practicable in continuous operation.

The motion of the roller shall at all times be slow enough to avoid displacement of the mixture and in no case shall the roller speed exceed 130 feet per minute. Any displacement of the mixture occurring as a result of reversing the direction of the roller or from any other cause, and any other surface irregularities developed by rolling, shall at once be corrected by the use of rakes, and fresh mixture applied when required. Straightedging and backpatching shall be done immediately after initial compaction has been secured and while the material is still workable. To prevent adhesion of the mixture to the roller, the rolls shall be kept properly moistened, but excessive water will not be permitted.

For a radial distance of 8 inches around all structures, along curbs, gutters and where it is impracticable to obtain proper compaction with rollers, compaction shall be effected with hot iron tampers, smoothing irons or mechanical tampers.

(A) BASE AND BINDER COURSES. Base and Binder courses shall be rolled starting longitudinally at the extreme sides and proceed toward the center of the pavement, overlapping on each successive trip by about 1/2 the width of the rear roll, but not less than six inches.

No traffic, except in connection with the delivery of asphaltic mixtures, shall be permitted on the newly laid pavement without the permission of the Engineer. All areas which become coated with any foreign material or that are loose shall be removed and replaced with new material.

The binder or base course after compaction shall not show an excess of asphalt cement and any material showing such excess shall be removed and replaced with new material. Any material broken up excessively during the process of spreading or rolling or which remains unbound after rolling shall be removed and replaced with new material. Rolling of binder courses shall continue until all roller marks are eliminated.

(B) SURFACE COURSES. Rolling of surface courses shall start longitudinally at the extreme sides and proceed toward the center of the pavement, overlapping on each successive trip at least 1/2 the width of rear roll. If required by the Engineer, the surface shall then be subjected to a diagonal rolling in 2

directions, the second diagonal crossing the lines of the first. Rolling of surface courses shall continue until all roller marks are eliminated and required compaction attained.

The surface course after compaction shall not show any excess of asphalt cement and any material showing such an excess shall be removed and replaced with new material. Any material broken up excessively during the process of spreading or rolling or which remains unbound after rolling shall be removed and replaced with new material.

(C) DENSITY REQUIREMENTS. The Bituminous Concrete pavements shall be compacted to the densities indicated herein:

Base and Binder Courses - not less than 94 percent of the bulk density of a standard specimen as prescribed in AASHTO T 245 for the number of molding blows required for the job mix formula.

Surface Courses - not less than 96 percent of the bulk density of a standard specimen as prescribed in AASHTO T 245 for the number of molding blows required for the job mix formula.

When a reference mold density per AASHTO T 245 is not available, the specific gravity determined by AASHTO T 209 will be used with the following minimum requirements; surface course, 92 percent, binder course, 88 percent and base course, 90 percent.

401.12 SURFACE COURSE JOINTS

In the event that surface course paving by the echelon method is not required or permitted, or the joint cools below 140°F, or where the new asphalt is placed against an old pavement, surface course longitudinal joints shall be cut back on a vertical face by means of a power masonry saw, or alternative method approved by the Engineer, until a thoroughly compacted full thickness of section is exposed. In general, the required cut shall be from 3 to 6 inches from the edge of the cold joint, but in no case shall it be less than 3 inches. Disposal of materials removed from cut joint shall be included in work. Traffic shall not be permitted to cross the cut edge prior to placing adjoining lane. Before placing fresh asphalt mix against cut joint, adjacent area of old pavement shall be thoroughly cleaned and the exposed cut edge shall be given a light coat of rapid set emulsified asphalt. The fresh mixture shall then be raked against the joint and thoroughly tamped with hot tampers and rolled.

The surface across all joints shall be tested with a 10 foot straightedge meeting the requirements of 903.03 and shall meet the requirements for smoothness of asphaltic surface of these specifications.

401.13 PAVEMENT SAMPLES

When specified the Contractor shall cut samples from the compacted pavement for testing by the Engineer. Samples of the mixture shall be taken for the full depth of the course at the locations directed by the Engineer.

401.14 SURFACE TOLERANCES

Immediately following second or intermediate rolling, the surface will be tested in the approximate center of each wheel lane with a "roadrater" or by survey.

The roadrater, which will be furnished by the Contractor and operated by the District, will be set to

indicate any irregularity exceeding 1/8 inch in 10 feet.

Any irregularities in the surface of roadways exceeding 1/8 inch must be corrected. A ten foot straightedge meeting the requirements of 903.03 shall be used for checking the surface. Irregularities from true grade which develop before the completion of rolling shall be remedied.

The entire affected area of any surface irregularity found shall be loosened promptly and sufficient material removed or new material placed to form a true and even surface. Its location will be marked and rechecked by the Engineer after final compaction is complete.

In the event any such irregularity, as determined by the Engineer, exists after final compaction is complete, the sum equal to 1/10 of 1 ton at the contract unit price for the appropriate surface item will be deducted from monies due the Contractor for each such irregularity, or the surface course, at the discretion of the Engineer, may be removed to its full depth and new material laid to form a true and even surface, and the costs thereof shall be borne by the Contractor.

The surface within areas occurring on arcs of vertical and horizontal curves, within 25 feet of the P.C. or P.T., within 25 feet of an intersecting street or within 25 feet of a change in grade, will not be considered in roadrater tests. However, irregularities at these locations may be ascertained by accurate survey measurements with due consideration given to specified changes in grade.

401.15 PROTECTION OF ASPHALTIC PAVEMENT

After the asphaltic mixture has received its final rolling, no vehicular traffic shall be permitted on the pavement until it has properly hardened as determined by the Engineer.

401.16 CLEANING UP

On completion of the work, all surplus materials, dirt, and debris of every description shall be removed and the area cleaned to the satisfaction of the Engineer. The edges of the surface course adjacent to gutters, curbs or shoulders shall be neatly trimmed.

401.17 PAVEMENT CORES

(A) GENERAL. The Contractor shall provide the equipment needed and the labor to obtain pavement cores for consolidation (compaction) and pavement thickness verification. A minimum of 3 cores per block or 500 feet of pavement shall be obtained by water cooled diamond bits for minimum disturbance of the finished pavement and the created holes shall be filled and compacted with asphalt mix in layers not exceeding 2 inches. The total number and size of cores shall represent the minimum surface area or quantity as specified in AASHTO T168, Sampling Bituminous Paving Mixtures. The location of the cores shall be selected by the Engineer.

(B) MEASURE AND PAYMENT. No measure or payment will be made. Cost of Pavement Cores shall be reflected and distributed among Asphalt Pay Items.